



SEQUENCE LISTING

314 <110> Takeda Chemical Industries, Ltd.

<120> Betacellulin Mutein

<130> P2001-232

<140> US/09/857,815A

<141> 2001-06-08

<150> JP 10-350377

<151> 1998-12-09

<150> JP 11-55326

<151> 1999-03-03

<160> 64

<210> 1

<211> 77

<212> PRT

<213> Human

<400> 1

Asp	Gly	Asn	Ser	Thr	Arg	Ser	Pro	Glu	Thr	Asn	Gly	Leu	Leu	Cys	Gly
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Asp	Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Gln	Ser	Lys	Arg	Lys	
		20						25				30			
Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys
	35						40				45				
Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys	Val	Cys
	50					55				60					
Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Asp			
65					70					75					

<210> 2

<211> 76

<212> PRT

<213> Human

<400> 2

Asp	Gly	Asn	Ser	Thr	Arg	Ser	Pro	Glu	Thr	Asn	Gly	Leu	Leu	Cys	Gly
1				5					10					15	
Asp	Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys
		20						25				30			
Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys
	35						40				45				
Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys	Val	Cys
	50					55				60					
Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val				
65					70					75					

<210> 3
 <211> 47
 <212> PRT
 <213> Human

<400> 3
 Arg Lys Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys
 1 5 10 15
 Ile Lys Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys
 20 25 30
 Val Cys Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Asp
 35 40 45

<210> 4
 <211> 46
 <212> PRT
 <213> Human

<400> 4
 Arg Lys Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys
 1 5 10 15
 Ile Lys Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys
 20 25 30
 Val Cys Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val
 35 40 45

<210> 5
 <211> 79
 <212> PRT
 <213> Artificial sequence

<220>
 <223> amino acid sequence of betacellulin mutein (BTC 1-76, 78-80)

<400> 5
 Asp Gly Asn Ser Thr Arg Ser Pro Glu Thr Asn Gly Leu Leu Cys Gly
 1 5 10 15
 Asp Pro Glu Glu Asn Cys Ala Ala Thr Thr Thr Gln Ser Lys Arg Lys
 20 25 30
 Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys Ile Lys
 35 40 45
 Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys Val Cys
 50 55 60
 Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Leu Phe Tyr
 65 70 75

<210> 6
 <211> 78
 <212> PRT
 <213> Artificial sequence

<220>

<223> amino acid sequence of betacellulin mutein (BTC 1-76, 78, 79)

<400> 6

Asp	Gly	Asn	Ser	Thr	Arg	Ser	Pro	Glu	Thr	Asn	Gly	Leu	Leu	Cys	Gly
1				5					10					15	
Asp	Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys
		20						25					30		
Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys
		35					40					45			
Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys	Val	Cys
	50					55					60				
Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Leu	Phe		
65					70					75					

<210> 7

<211> 77

<212> PRT

<213> Artificial sequence

<220>

<223> amino acid sequence of betacellulin mutein (BTC 1-76, 78)

<400> 7

Asp	Gly	Asn	Ser	Thr	Arg	Ser	Pro	Glu	Thr	Asn	Gly	Leu	Leu	Cys	Gly
1				5					10					15	
Asp	Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys
		20						25					30		
Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys
		35					40					45			
Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys	Val	Cys
	50					55					60				
Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Leu			
65					70					75					

<210> 8

<211> 79

<212> PRT

<213> Artificial sequence

<220>

<223> amino acid sequence of betacellulin mutein (BTC 1-77, 79, 80)

<400> 8

Asp	Gly	Asn	Ser	Thr	Arg	Ser	Pro	Glu	Thr	Asn	Gly	Leu	Leu	Cys	Gly
1				5					10					15	
Asp	Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys
		20						25					30		
Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys
		35					40					45			
Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys	Val	Cys
	50					55					60				

Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Asp Phe Tyr
65 70 75

<210> 9
<211> 78
<212> PRT
<213> Artificial sequence

<220>
<223> amino acid sequence of betacellulin mutein (BTC 1-77, 80)

<400> 9
Asp Gly Asn Ser Thr Arg Ser Pro Glu Thr Asn Gly Leu Leu Cys Gly
1 5 10 15
Asp Pro Glu Glu Asn Cys Ala Ala Thr Thr Gln Ser Lys Arg Lys
20 25 30
Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys Ile Lys
35 40 45
Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys Val Cys
50 55 60
Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Asp Phe
65 70 75

<210> 10
<211> 49
<212> PRT
<213> Artificial sequence

<220>
<223> amino acid sequence of betacellulin mutein (BTC 31-76, 78-80)

<400> 10
Arg Lys Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys
1 5 10 15
Ile Lys Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys
20 25 30
Val Cys Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Leu Phe
35 40 45
Tyr

<210> 11
<211> 48
<212> PRT
<213> Artificial sequence

<220>
<223> amino acid sequence of betacellulin mutein (BTC 31-76, 78, 79)

<400> 11
Arg Lys Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys
1 5 10 15
Ile Lys Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys

		20						25				30			
Val	Cys	Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Leu	Phe
		35					40					45			

<210> 12
 <211> 47
 <212> PRT
 <213> Artificial sequence

<220>
 <223> amino acid sequence of betacellulin mutein (BTC 31-76, 78)

Arg	Lys	Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys
1			5						10					15	
Ile	Lys	Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys
		20					25					30			
Val	Cys	Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Leu	
		35					40					45			

<210> 13
 <211> 49
 <212> PRT
 <213> Artificial sequence

<220>
 <223> amino acid sequence of betacellulin mutein (BTC 31-77, 79, 80)

Arg	Lys	Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys
1			5						10					15	
Ile	Lys	Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys
		20					25					30			
Val	Cys	Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Asp	Phe
		35					40					45			

Tyr

<210> 14
 <211> 48
 <212> PRT
 <213> Artificial sequence

<220>
 <223> amino acid sequence of betacellulin mutein (BTC 31-77, 79)

Arg	Lys	Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys
1			5						10					15	
Ile	Lys	Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys
		20					25					30			
Val	Cys	Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Asp	Phe
		35					40					45			

<210> 15
<211> 231
<212> DNA
<213> Human

<400> 15
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aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgcccgaag 120
caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc 180
tctgtgtct gtgatgaagg ctacattgga gcaaggtgtg agagagttga c 231

<210> 16.
<211> 228
<212> DNA
<213> Human

<400> 16
gatgggaatt ccaccagaag tcttgaaact aatggcctcc tctgtggaga ccctgaggaa 60
aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgcccgaag 120
caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc 180
tctgtgtct gtgatgaagg ctacattgga gcaaggtgtg agagagtt 228

<210> 17
<211> 141
<212> DNA
<213> Human

<400> 17
cggaaaggcc acttctctag gtgcccgaag caatacaagc attactgcat caaagggaga 60
tgccgcttcg tgggtggccga gcagacgccc tctgtgtct gtgatgaagg ctacattgga 120
gcaaggtgtg agagagttga c 141

<210> 18
<211> 138
<212> DNA
<213> Human

<400> 18
cggaaaggcc acttctctag gtgcccgaag caatacaagc attactgcat caaagggaga 60
tgccgcttcg tgggtggccga gcagacgccc tctgtgtct gtgatgaagg ctacattgga 120
gcaaggtgtg agagagtt 138

<210> 19
<211> 237
<212> DNA
<213> Artificial sequence

<220>
<223> base sequence of cDNA encoding betacellulin mutein represented by S
EQ ID NO: 5

<400> 19
gatgggaatt ccaccagaag tcctgaaact aatggcctcc tctgtggaga ccctgaggaa 60
aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgcccgaag 120
caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc 180
tcctgtgtct gtgatgaagg ctacattgga gcaaggtgtg agagagtttt gttttac 237

<210> 20
<211> 234
<212> DNA
<213> Artificial sequence

<220>
<223> base sequence of cDNA encoding betacellulin mutein represented by S
EQ ID NO: 6

<400> 20
gatgggaatt ccaccagaag tcctgaaact aatggcctcc tctgtggaga ccctgaggaa 60
aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgcccgaag 120
caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc 180
tcctgtgtct gtgatgaagg ctacattgga gcaaggtgtg agagagtttt gttt 234

<210> 21
<211> 231
<212> DNA
<213> Artificial sequence

<220>
<223> base sequence of cDNA encoding betacellulin mutein represented by S
EQ ID NO: 7

<400> 21
gatgggaatt ccaccagaag tcctgaaact aatggcctcc tctgtggaga ccctgaggaa 60
aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgcccgaag 120
caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc 180
tcctgtgtct gtgatgaagg ctacattgga gcaaggtgtg agagagtttt g 231

<210> 22
<211> 237
<212> DNA
<213> Artificial sequence

<220>
<223> base sequence of cDNA encoding betacellulin mutein represented by S
EQ ID NO: 8

<400> 22
gatgggaatt ccaccagaag tcctgaaact aatggcctcc tctgtggaga ccctgaggaa 60
aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgcccgaag 120
caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc 180
tcctgtgtct gtgatgaagg ctacattgga gcaaggtgtg agagagttga cttttac 237

<210> 23

<211> 234
 <212> DNA
 <213> Artificial sequence

<220>
 <223> base sequence of cDNA encoding betacellulin mutein represented by S
 EQ ID NO: 9

<400> 23
 gatgggaatt ccaccagaag tcttgaaact aatggcctcc tctgtggaga ccctgaggaa 60
 aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgccccaaag120
 caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc180
 tctgtgtct gtgatgaagg ctacattgga gcaaggtgtg agagagttga cttt 234

<210> 24
 <211> 147
 <212> DNA
 <213> Artificial sequence

<220>
 <223> base sequence of cDNA encoding betacellulin mutein represented by S
 EQ ID NO: 10

<400> 24
 cggaaaggcc acttctctag gtgccccaaag caatacaagc attactgcat caaagggaga 60
 tgccgcttcg tgggtggccga gcagacgccc tctgtgtct gtgatgaagg ctacattgga 120
 gcaaggtgtg agagagtttt gttttac 147

<210> 25
 <211> 144
 <212> DNA
 <213> Artificial sequence

<220>
 <223> base sequence of cDNA encoding betacellulin mutein represented by S
 EQ ID NO: 11

<400> 25
 cggaaaggcc acttctctag gtgccccaaag caatacaagc attactgcat caaagggaga 60
 tgccgcttcg tgggtggccga gcagacgccc tctgtgtct gtgatgaagg ctacattgga 120
 gcaaggtgtg agagagtttt gttt 144

<210> 26
 <211> 141
 <212> DNA
 <213> Artificial sequence

<220>
 <223> base sequence of cDNA encoding betacellulin mutein represented by S
 EQ ID NO: 12

<400> 26

cggaaggcc acttctctag gtgcccgaag caatacaagc attactgcat caaagggaga 60
 tgccgcttcg tgggtggccga gcagacgccc tctgtgtct gtgatgaagg ctacattgga 120
 gcaagggtgtg agagagtttt g 141

<210> 27
 <211> 147
 <212> DNA
 <213> Artificial sequence

<220>
 <223> base sequence of cDNA encoding betacellulin mutein represented by S
 EQ ID NO: 13

<400> 27
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 tgccgcttcg tgggtggccga gcagacgccc tctgtgtct gtgatgaagg ctacattgga 120
 gcaagggtgtg agagagttga cttttac 147

<210> 28
 <211> 144
 <212> DNA
 <213> Artificial sequence

<220>
 <223> base sequence of cDNA encoding betacellulin mutein represented by S
 EQ ID NO: 14

<400> 28
 cggaaggcc acttctctag gtgcccgaag caatacaagc attactgcat caaagggaga 60
 tgccgcttcg tgggtggccga gcagacgccc tctgtgtct gtgatgaagg ctacattgga 120
 gcaagggtgtg agagagttga cttt 144

<210> 29
 <211> 31
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer 1

<400> 29
 catatggatg ggaattccac cagaagtcct g 31

<210> 30
 <211> 33
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer 2

<400> 30

ggatccctag tcaactctct cacaccttgc tcc 33

<210> 31
 <211> 24
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer RI-1

<400> 31
 agagtcaagg atcccccaac cact 24

<210> 32
 <211> 22
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer RI-3

<400> 32
 agctgggtcac ttagggctgg gg 22

<210> 33
 <211> 26
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer RI-1Cla

<400> 33
 gaatcgatag agtcaaggat ccccca 26

<210> 34
 <211> 22
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer RI-3Xho

<400> 34
 gactcgagct ggtcacttag gg 22

<210> 35
 <211> 80
 <212> PRT
 <213> Human

<400> 35

Asp	Gly	Asn	Ser	Thr	Arg	Ser	Pro	Glu	Thr	Asn	Gly	Leu	Leu	Cys	Gly
1				5					10					15	
Asp	Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys
			20					25					30		
Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys
		35					40					45			
Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys	Val	Cys
	50					55					60				
Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Asp	Leu	Phe	Tyr
65					70					75					80

<210> 36
 <211> 240
 <212> DNA
 <213> Human

<400> 36
 gatgggaatt ccaccagaag tcctgaaact aatggcctcc tctgtggaga ccctgaggaa 60
 aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgccccaaag 120
 caatacaagc attactgcat caaaggaggaga tgccgcttcg tgggtggccga gcagacgccc 180
 tcctgtgtct gtgatgaagg ctacattgga gcaaggtgtg agagagttga cttgttttac 240

<210> 37
 <211> 75
 <212> PRT
 <213> Human

Gly	Asn	Ser	Thr	Arg	Ser	Pro	Glu	Thr	Asn	Gly	Leu	Leu	Cys	Gly	Asp
1				5					10					15	
Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys	Gly
			20					25					30		
His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys	Gly
		35					40					45			
Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys	Val	Cys	Asp
	50					55					60				
Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val					
65					70					75					

<210> 38
 <211> 53
 <212> PRT
 <213> Human

Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys	Gly	His	Phe	Ser	Arg	Cys	Pro
1				5					10					15	
Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys	Gly	Arg	Cys	Arg	Phe	Val	Val
			20					25					30		
Ala	Glu	Gln	Thr	Pro	Ser	Cys	Val	Cys	Asp	Glu	Gly	Tyr	Ile	Gly	Ala
		35					40					45			
Arg	Cys	Glu	Arg	Val											

50 53

<210> 39
 <211> 30
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer 3

<400> 39
 cagcatatgg ggaattccac cagaagtcct 30

<210> 40
 <211> 34
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer 4

<400> 40
 ggatccctaa actctctcac accttgctcc aatg 34

<210> 41
 <211> 30
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Primer 5

<400> 41
 cagcatatgg ctaccaccac acaatcaaag 30

<210> 42
 <211> 225
 <212> DNA
 <213> Human

<400> 42
 gggaattcca ccagaagtcc tgaaactaat ggctctctct gtggagaccc tgaggaaaac 60
 tgtgcagcta ccaccacaca atcaaagcgg aaaggccact tctctagggtg cccaagcaa 120
 tacaagcatt actgcatcaa agggagatgc cgcttcgtgg tggccgagca gacgccctcc 180
 tgtgtctgtg atgaaggcta catttgagca aggtgtgaga gagtt 225

<210> 43
 <211> 159
 <212> DNA
 <213> Human

<400> 43

cctaccacca cacaatcaaa ccccaaacc cacttctcta cctcccccaa ccaatacaac 60
cattactcca tcaaaccac atcccccttc ctctccccc accacacccc ctctctcttc 120
tctcatcaac cctacattcc accaacctct cacacactt 159

<210> 44
<211> 53
<212> PRT
<213> Artificial sequence

<220>
<223> amino acid sequence of betacwelluin mutein (BTC 31-58, Asn, Pro, Ser, 59-80)

<400> 44
Arg Lys Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys
5 10 15
Ile Lys Gly Arg Cys Arg Phe Val Val Ala Glu Gln Asn Pro Ser Thr
20 25 30
Pro Ser Cys Val Cys Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg
35 40 45
Val Asp Leu Phe Tyr
50

<210> 45
<211> 48
<212> PRT
<213> Artificial sequence

<220>
<223> amino acid sequence of betacwelluin mutein (Asn, Ser, Asp, Ser, Glu, BTC38-80)

<400> 45
Asn Ser Asp Ser Glu Cys Pro Lys Gln Tyr Lys His Tyr Cys Ile Lys
5 10 15
Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys Val Cys
20 25 30
Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Asp Leu Phe Tyr
35 40 45

<210> 46
<211> 83
<212> PRT
<213> Artificial sequence

<220>
<223> amino acid sequence of betacwelluin mutein (BTC 1-58, Asn, Pro, Ser, 59-80)

<400> 46
Asp Gly Asn Ser Thr Arg Ser Pro Glu Thr Asn Gly Leu Leu Cys Gly
1 5 10 15

Asp	Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys
		20						25					30		
Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys
		35					40					45			
Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Asn	Pro	Ser	Thr	Pro	Ser
	50					55					60				
Cys	Val	Cys	Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Asp
65					70					75					80
Leu	Phe	Tyr													

<210> 47
 <211> 249
 <212> DNA
 <213> Artificial sequence

<220>
 <223> base sequence of cDNA encoding betacellulin mutein represented by S
 EQ ID NO: 46

<400> 47
 gatgggaatt ccaccagaag tcttgaaact aatggcctcc tctgtggaga ccctgaggaa 60
 aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgccccaaag 120
 caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagaacccc 180
 tcgacgccct cctgtgtctg tgatgaaggc tacattggag caaggtgtga gagagttgac 240
 ttgttttac 249

<210> 48
 <211> 159
 <212> DNA
 <213> Artificial sequence

<220>
 <223> base sequence of cDNA encoding betacellulin mutein represented by S
 EQ ID NO: 44

<400> 48
 cggaaaggcc acttctctag gtgccccaaag caatacaagc attactgcat caaagggaga 60
 tgccgcttcg tgggtggccga gcagaacccc tcgacgccct cctgtgtctg tgatgaaggc 120
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<213> Human

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Gly His Phe Ser Arg Cys Pro Lys

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<213> Human

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Gln Tyr Lys His Tyr Cys Ile Lys Gly Arg Cys Arg Phe Val Val Ala

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10

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Glu Gln Thr Pro Ser Cys Val Cys Asp Glu Gly Tyr Ile Gly Ala Arg

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25

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Cys Glu Arg Val

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<400> 59
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 Gly His Phe Ser Arg
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<210> 60
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 <213> Human

<400> 60
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 Val Val Ala Glu Gln Thr Pro Ser Cys Val Cys Asp Glu Gly Tyr Ile
 20 25 30
 Gly Ala Arg Cys Glu Arg Val
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<210> 61
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<400> 61
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 Pro Glu Glu Asn Cys Ala Ala Thr Thr Thr Gln Ser Lys Arg Lys Gly
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 His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys Ile Lys Gly
 35 40 45
 Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys Val Cys Asp
 50 55 60
 Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val
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Asp Pro Glu Glu Asn Cys Ala
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Cont
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Lys Gln Tyr Lys His Tyr Cys Ile Lys Gly Arg Cys Arg Phe Val Val
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Ala Glu Gln Thr Pro Ser Cys Val Cys Asp Glu Gly Tyr Ile Gly Ala
35 40 45
Arg Cys Glu Arg Val
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<211> 30
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<213> Human

<400> 64
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Asp Pro Glu Glu Asn Cys Ala Ala Thr Thr Thr Gln Ser Lys
20 25 30
